Final Report

AUSTRALIAN MEAT PROCESSOR CORPORATION

“Grow with Demand”

Develop New Fully Automated “Grow with Demand” Vacuum Packaging System

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1.0 Abstract

This project was undertaken to solve two critical problems for red meat processors: the lack of floor space in already crowded boning rooms, and the high cost of upgrading or replacing packaging equipment when demand increases. Traditional rotary vacuum systems occupy a large footprint, making them difficult to install in most facilities, and require major investment when capacity needs change. The solution developed was a patented “Grow with Demand” vacuum packaging machine that requires very little floor space and can expand capacity as needed.

The project was carried out in four stages: design and engineering, prototype build, long-term testing, and industry validation. Advanced computer modelling guided the chamber design, which was then refined through hands-on testing. Close collaboration with processors ensured the machine was designed around real-world constraints and industry-preferred components were adopted to support reliability and acceptance.

The key results were the successful development of a prototype with a footprint of only 5 m^2, significantly less than rotary systems, while achieving speeds of up to 50 packs per minute and reducing energy use by up to 50%. The modular design allows smaller processors to start with a single-chamber machine and later add a second chamber to double capacity without any extra floor space. For larger processors, the double-chamber system is a direct replacement for rotary machines, offering higher efficiency and much lower space requirements.

The benefits to industry are substantial: scalable growth, lower costs, reduced emissions, and above all, a dramatically smaller footprint that makes this technology adoptable by almost every processing plant, from the smallest facility to the largest processor.

2.0 Executive summary

2.1 Overview

This project was undertaken to address two major challenges in red meat processing: the lack of floor space in boning rooms and the high cost of replacing or upgrading vacuum packaging machines when demand increases. Current rotary packaging systems are large, take up considerable floor space, and require processors to completely reconfigure facilities when additional capacity is needed. The “Grow with Demand” project set out to develop a new type of vacuum packaging system that requires very little space and can grow with the processor’s needs, offering a practical and future-ready alternative.

The main target audience for this research includes small to medium processors seeking affordable entry-level equipment, as well as large processors who may need to replace outdated rotary systems. For levy payers and industry stakeholders, the results mean access to a more flexible, cost-efficient, and sustainable packaging solution that can be adopted in nearly all plants, regardless of size.

2.2 Objectives

The objectives of the project were to:

- Develop and test a patented “Grow with Demand” vacuum packaging machine.
- Deliver a machine with the smallest footprint available on the market.
- Enable processors to start with a single chamber and later add a second chamber to double output.
- Reduce energy consumption by up to 50% compared to existing rotary systems.
- Ensure the machine is ready for commercial adoption by the end of the project.

All objectives were achieved, with a prototype successfully built, tested, and validated with industry partners.

2.3 Methodology
The project was conducted in four phases:

- **Design and Engineering**, machine specifications, mechanical and automation design, and modelling of chamber strength.
- **Prototype Build**, first prototype manufactured and assembled in Germany.
- **Testing and Refinement**, long-term vacuum trials and design adjustments based on real-world performance.
- **Industry Validation**, installation at Nolans Meats and engagement with processors to confirm performance and acceptance.

2.4 Results and Key Findings
The project delivered a working prototype with a footprint of just 5 m^2, significantly smaller than rotary systems. The system achieved speeds of up to 50 packs per minute and energy savings of over 50%. Smaller processors can use a single-chamber version and later expand to two chambers without additional space, labour, or energy. Larger processors can replace outdated rotary machines with the double-chamber version, gaining higher efficiency with much lower space requirements. Market interest has been strong, with early orders placed during the development phase.

2.5 Benefits to Industry
The system provides processors with scalable growth, lower capital and operating costs, reduced carbon emissions, and the flexibility to upgrade capacity without disruption. Above all, the small footprint makes it suitable for almost every plant, from the smallest operator to the largest processor.

2.6 Future Research and Recommendations
Future research should focus on integrating automated bagging and loading systems to extend the benefits of “Grow with Demand” into a complete automatic packaging line. Continued long-term testing will ensure durability, while demonstration and adoption activities should highlight the space and cost savings to accelerate industry uptake.

3.0 Introduction

The Australian red meat processing industry faces increasing pressure to expand packaging capacity while managing rising costs, limited labour availability, and sustainability demands. One of the most persistent constraints is floor space in boning rooms, which are already crowded with equipment. Traditional rotary vacuum packaging machines are large, require significant installation space, and are costly to replace when processors outgrow their current capacity. This has created a clear knowledge and technology gap: processors require packaging systems that are compact, scalable, and efficient, yet such systems are not currently available in the market.

The main research question addressed by this project was:
Can a small-footprint vacuum packaging system be designed that allows processors to “grow with demand” by doubling output within the same frame, without requiring extra space, labour, or energy? This question was central because space and scalability are consistently identified by processors as the most critical barriers to upgrading packaging operations.

The target audience for this project spans both ends of the industry:

- Smaller processors who require an affordable entry-level solution and need the confidence that their investment can grow with production demand over time.

- Larger processors who need a direct alternative to rotary machines, allowing them to replace outdated equipment with a system that is more compact, energy efficient, and cost-effective.

The results of this research will be used to provide levy payers and industry stakeholders with a commercially ready packaging solution that overcomes long-standing constraints. The machine's unique ability to double throughput within the same footprint is expected to improve competitiveness, reduce capital outlay, and support sustainable operations. The outcomes will guide adoption decisions for processors, inform industry investment in packaging technologies, and serve as a foundation for further automation developments such as integrated bagging and loading systems.

This project is unique compared to existing alternatives because no current technology offers true "grow with demand" functionality. Competitor systems require full replacement, additional floor space, or major layout changes to increase capacity. In contrast, the solution developed in this project provides a future-ready upgrade path suitable for almost every Australian processing plant

4.0 Project objectives

4.1 Stage 1 "Grow with Demand" System

Develop, design and manufacture of Grow with Demand Packaging Solution, which provides double vacuum packing throughput for the customer by adding a second vacuum chamber into existing packaging machine. No other changes required.

4.2 High Packaging Speed

Achieving the highest packaging throughput on the market.

4.3 Reducing machine floor space to a minimum

Aiming for a max 5 sqm of main system for a production capacity of up to 50 packs per minute (lamb)
(Rotary requires around 4 times as much floor space).

4.4 Reduction of energy consumption to up to 50% compared to existing technology

Minimum energy requirements of around 38 kW for a production capacity of up to 60 packs per minute
Current technology requires up to double the energy resources at even less productivity.

4.5 Reduction of Carbon emissions

Designing a highly efficient dry running vacuum system and vacuum chamber movement system, reducing carbon emissions of up to 60%

4.6 Reliability of vacuum integrity

Designing the sealing system to minimize rework of vacuum-packed products.

4.7 Commercially ready by end of R&D project

Prepare all marketing information and market launch during phase 4 of the project to be commercially ready by end of the project.

4.8 Patent application enters global phase

We have applied for our patent in the USA and will also apply for global patent protection.

Achievement of objectives:

All project objectives were achieved. The system was designed, manufactured, and validated in line with the agreed goals. The prototype demonstrated high throughput, significantly reduced floor space requirements compared to rotary systems, energy savings of up to 50%, and strong vacuum integrity. The modular design was successfully proven, enabling smaller processors to start with a single chamber and expand to a double-chamber machine without increasing footprint, labour, or energy. A patent application was filed in the USA and a global patent application has now been initiated, which will be pursued over the coming months. The machine is commercially ready with early industry orders already placed.

5.0 Methodology

The project was conducted in four structured phases, moving from design and engineering through to prototype manufacture, testing, and industry validation. The overall aim was to design and deliver a compact, expandable vacuum packaging machine that could be adopted across the red meat sector.

5.1 Design and engineering

The project began with detailed machine specifications and the development of a modular “Grow with Demand” concept that would allow capacity to be doubled within the same frame. Finite Element Modelling (FEM) was used extensively to simulate chamber strength under vacuum. Early FEM results underestimated deformation forces, leading to several redesign and stiffening iterations. These improvements were validated through testing until a stable chamber design was achieved.

As part of the design phase, Seeger Automation completed the full electrical hardware design and E-Plan schematics, ensuring compliance with industry standards and laying the foundation for automation integration.

Supplier specification changes
During development, key changes were made to automation and drive suppliers to better align with meat industry preferences. The original specifications (Beckhoff automation and drives) were replaced with Allen Bradley (PLC) and SEW (drive systems)**.** This change was strongly supported by processors and provides better fit and serviceability for both Australian and global meat markets.

Team structure and collaboration
The project was fast-tracked by an interdisciplinary approach. Multiple teams worked in parallel and held regular review meetings to identify improvements quickly and minimize errors:

- **Mechanical design**: Schwarz Systems (machine frame, infeed, and outfeed).
- **Vacuum system and chamber engineering**: Leisinger Engineering.
- **Electrical hardware design & E-Plan**: Seeger Automation.
- **Automation and Software**: NEMA Automation.
- **Manufacturing and assembly**: Schwarz Systems.

- **Overall coordination and integration**: StarVac (led by Lothar Künzel), including regular consultation with processors to ensure market needs were addressed.

5.2 Manufacturing and testing

The first prototype was manufactured and assembled at the StarVac facility in Kandern, Germany. Extensive testing was conducted on-site to confirm footprint, throughput, vacuum integrity, and energy consumption. Several design adjustments were implemented during assembly and testing to further improve performance.

5.3 Industry validation

Following internal validation, the first machine was sold and installed at Nolans Meats in Gympie, Queensland. This installation provided real-world validation of the system and confirmed the machine’s acceptance by processors.

5.4 Project context

This project represents the first stage in a broader innovation pathway. The “Grow with Demand” system is the smallest vacuum packaging machine in the world and uniquely allows processors to increase capacity by adding a second chamber within the same footprint. The next stage of development will build on this success to create a fully unmanned packaging line with automated bagging and loading functions.

5.0 Results

The project successfully delivered and validated a working prototype of the “Grow with Demand” vacuum packaging system. Key measurable outcomes are presented below.

6.1 Machine Footprint

The prototype achieved a footprint of approximately 5 m²**,** significantly smaller than rotary vacuum systems, which typically require four to five times more space. This compact design directly addresses one of the most critical barriers to adoption in the industry: limited boning room space.

6.2 Packaging Throughput

- The single-chamber configuration achieved 20–25 packs per minute, making it suitable for smaller processors.
- The double-chamber configuration achieved up **to** 50 packs per minute for lamb, positioning it as a direct competitor to large rotary systems.

6.3 Energy Consumption

Testing confirmed that the “Grow with Demand” system uses significantly less energy than rotary machines. The prototype required approximately 27 kW at higher production capacity, compared to approximately 74 kW for rotary systems operating at lower throughput.

6.4 Vacuum Integrity and Reliability

Finite Element Modelling (FEM) was used to predict chamber performance under vacuum. Early calculations underestimated deformation forces, leading to redesigns that increased stiffness. Long-term testing validated the chamber’s ability to withstand forces of around 16 tonnes, ensuring reliable vacuum integrity and reducing rework.

Longterm validation has proven that a rework rate of less than 3% was achieved. The rework rate not considering the large T-Bones is below 1%. Taking the larger T-Bones into consideration a rework rate of 3 – 4 % is experienced. Further improvements will also reduce the T-Bone reject rate to below 3%.

6.5 Carbon Emissions

By combining efficient chamber movement with a dry-running vacuum pump option, the system demonstrated the potential to reduce emissions by up more than 60% compared with rotary technology.

6.6 Market Validation

The first commercial unit was installed at Nolans Meats in Gympie, Queensland, where it was tested under commercial operating conditions. Feedback confirmed strong acceptance of the machine's small footprint and modular design. Early industry orders were secured before project completion, highlighting market readiness.

Comparative Performance Table: "Grow with Demand" vs Rotary 8600

Performance Indicator	**Rotary 8600 (Benchmark)**	**"Grow with Demand" System**
Footprint (main system)	Approx. 20–25 m²	5 m² (significantly smaller)
Throughput – Lamb	Approx. 30 – 40 packs/min	Up to 50 packs/min
Throughput – Beef	Appox 30 packs/min	Up to 30 packs/min
Energy Consumption	74 kW	24 kW (more than 60% reduction)
Carbon Emissions	Baseline	More than 60% lower
Upgrade Flexibility	New machine required	Add-on chamber doubles output
Installation / Layout Changes	Requires reconfiguration	No layout change needed

Figure 1: Compared with Cryovac's 8600 rotary system

6.0 Discussion

The results of this project confirm that the "Grow with Demand" vacuum packaging system delivers a unique combination of high throughput, energy efficiency, and a very small footprint. These findings have significant implications for adoption by both small and large red meat processors and for future industry innovation.

7.1 Adoption by processors

The compact footprint of around 5 m² is one of the most critical outcomes. Limited floor space is a common and ongoing constraint in boning rooms, and existing rotary systems are often too large to be installed without major plant reconfiguration. By addressing this barrier, the new system can be adopted in almost any processing facility.

For smaller processors, the single-chamber system offers an affordable entry point into high-quality vacuum packaging. Its modular design provides a low-risk growth pathway, as processors can double output by adding a second chamber without the cost or disruption of replacing equipment, adding staff, or changing plant layouts.

For larger processors, the double-chamber system provides a direct replacement for rotary machines such as the 8600 series. Test results show that throughput is equal to or greater than rotary systems while requiring significantly less space and energy. This positions the Jupiter X technology as a competitive alternative for major processors seeking to upgrade outdated equipment.

7.2 Broader industry implications

The project's results extend beyond individual adoption:

- **Competitiveness**: The combination of smaller footprint, lower capital outlay, and reduced operating costs improves the profitability of Australian processors and strengthens their ability to compete globally.
- **Sustainability**: Energy savings of more than 60% and carbon emissions reductions of more than 60% support the industry's environmental commitments and provide a marketable benefit in export markets.
- **Productivity and quality**: Improved chamber stiffness and reliable vacuum integrity reduce the risk of rework, increasing overall line efficiency and reducing waste.

7.3 Future research and related projects

This project represents the first stage in a broader innovation roadmap. The proven compact and modular platform lays the foundation for further development toward a fully automated packaging line. Stage 2 will extend this work to include unmanned bagging and loading systems. Additional future research opportunities include integration with data monitoring and predictive maintenance systems, as well as continued optimization of energy efficiency and vacuum technologies.

In summary, the results show that the "Grow with Demand" system is not only technically sound but also directly aligned with processor needs. Its small footprint and scalable design make it highly adoptable across the industry, from the smallest regional plant to the largest export processor, while also enabling future automation developments.

7.0 Conclusions

This project successfully developed and validated the "Grow with Demand" vacuum packaging system, a compact, modular machine that delivers high throughput with a footprint of only around 5 m². The system represents a clear alternative to traditional rotary machines, which are significantly larger and more energy intensive.

The results show that processors of all sizes can benefit:

- **Smaller processors** can adopt the single-chamber version as an affordable entry point, with the option to double productivity by adding a second chamber without additional space, labour, or energy.
- **Larger processors** can adopt the double-chamber version as a direct replacement for rotary systems, gaining equal or greater throughput with significantly lower floor space and energy demand.

For industry stakeholders, these findings demonstrate that packaging capacity can now be scaled without costly plant redesigns or major infrastructure upgrades. The system also supports industry sustainability goals, with energy savings of more than 60% and carbon reductions of more than 60%.

The project provides a strong foundation for future research into fully automated packaging lines, including bagging and loading integration, as well as digital monitoring and predictive maintenance. The "Grow with Demand" concept is therefore both an immediate solution for current processor needs and a steppingstone toward the industry's longer-term automation goals.

8.0 Recommendations

Based on the outcomes of this project, the following recommendations are provided for processors, industry stakeholders, and future research and development activities:

9.1 Practical application for industry

- Processors should consider the “Grow with Demand” system as both an entry-level solution (single chamber) for smaller plants and as a direct replacement for rotary machines (double chamber) in larger facilities.
- Adoption is most beneficial where floor space is limited, as the machine’s compact footprint removes one of the major barriers to upgrading packaging operations.
- Early industry adopters should prioritize installations in plants where expansion is constrained, to demonstrate the value of space and energy savings across the sector.

9.2 Future RD&E Opportunities

- Develop Stage 2 automation, extending the “Grow with Demand” system into a fully unmanned packaging line with integrated bagging and loading functions.
- Investigate digital monitoring and predictive maintenance technologies to further reduce downtime and support consistent performance.
- Explore additional vacuum system optimization and energy efficiency improvements to further reduce operating costs and emissions.

9.3 Adoption and Extension Activities

- Conduct targeted demonstrations and field days at early adopter sites (e.g., Nolans Meats) to showcase performance to other processors.
- Develop clear case studies highlighting cost savings, footprint advantages, and throughput performance to encourage wider adoption.
- Provide training and technical support packages to ensure processors can integrate the system effectively and realize its full benefits.

10.0 Project outputs

The project delivered a number of tangible outputs that demonstrate both the technical success of the “Grow with Demand” concept and its immediate commercial relevance to the industry.

10.1 Commercial Outputs

- Early industry uptake**:** Three systems were sold to processors before the project was finalized with AMPC, highlighting strong demand and rapid adoption potential.
- First industry installation: A system was successfully commissioned at Nolans Meats in Gympie, Queensland, validating performance under commercial operating conditions.

10.2 Technical and R&D Outputs

- Stage 1 system completed**:** The project successfully delivered Stage 1 of the automation roadmap, with the “Grow with Demand” vacuum packaging system now market ready.

- Foundation for Stage 2: Stage 1 results provide the technical and market platform for Stage 2 development: a fully automated packaging line including bagging and loading, incorporating robotics and AI to deliver maximum efficiency in minimal space.

10.3 Extension and Industry Engagement Outputs

- Participation in exhibitions, field days, processor presentations, and editorials is planned to support awareness and adoption.
- Digital communication via LinkedIn and industry media will be used to share results and processor experiences.
- Processor-led promotion**:** Positive recommendations from early adopters are expected to play a key role in accelerating adoption.
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10.4 Industry recognition outputs

- Engagement with international suppliers for processing room design and manufacturing, Marel Australia and Niras Australia**,** have already requested information on the Jupiter X system following processor feedback. This indicates recognition that the new system is a viable and superior alternative to outdated rotary technologies.

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12.0 Appendices

12.1 Appendix 1 – Technical Evidence

Appendix 1.1 E-Plan finalisation

Appendix 1.2 Operating Manual

Appendix 1.3 Risk Analysis

12.2 Appendix 2 – Industry Validation

Appendix 2.1 Photographs of the installation at Nolans Meats, Gympie (2025).

Appendix 2.2 Videos of operation at Nolan Meats

Appendix 2.3 Copy of confirmed purchase order from Nolans

Appendix 2.4 Validation Report at Nolans Meat

12.3 Appendix 3 – Commercialisation and Marketing

Appendix 3.1 AMPC commercialization flyer and promotional material used at the AMPC

12.4 Appendix 4 – Stage 2 Development Evaluation

Appendix 4.1 Feasibility study and recommendation of a solution for automating the packaging process with the support of AI and Robotics